REMARKS

I. Status of the Claims

Claims 1-19 are pending. Claims 16-19 have been withdrawn from consideration because of a restriction requirement. Applicants amend claims 2-4 in this response. Upon entry of this amendment, claims 1-15 will remain for consideration.

II. Replacement Abstract

The Examiner suggested that a structure in the Abstract would help searchers find art related to indenoindolyl complexes. Applicants agree, and they have therefore revised the Abstract by inserting an indenoindolyl ligand structure. The revision should overcome the objection.

III. Response to the Restriction Requirement

The Examiner requires restriction as follows: Group I, claims 1-15, drawn to catalysts; Group II, claims 16-19, drawn to an olefin polymerization process. During a telephone call between Examiner Jim Pasterczyk and Applicants' attorney on August 1, 2002, Applicants provisionally elected to prosecute Group I (claims 1-15), with traverse. After reviewing the Examiner's reasoning, Applicants are satisfied that the requirement is proper, and they will no longer traverse it. In the event that the Examiner finds patentable subject matter, he has Applicants' permission to cancel the non-elected claims.

IV. Response to the Section 112 Rejection

Applicants have amended claims 2 and 3 as requested by the Examiner to recite "comprises" rather than "includes." The amendment overcomes the rejection of these claims under 35 U.S.C. § 112, second paragraph, as being indefinite.

The Examiner noted that the variable R in claim 4 is not expressly defined. Applicants have amended claim 4 to replace the R with H. Support for the amendment is found in the structures on page 4 of the specification (see structures).

For the record, Applicants note that their intent was (and remains) for the indole nitrogen to be treated as any other "ring atom" of the indenoindolyl system. In other words, the language "in which each ring atom is unsubstituted or substituted with one or more alkyl, aryl, aralkyl, halogen, silyl, nitro, dialkylamino, diarylamino, alkoxy, aryloxy, or thioether groups" (emphasis added) in claim 4 is intended to apply to the indole nitrogen, the indenyl methylene carbon, and the eight aromatic carbons capable of bearing substituents, i.e., the non-quaternary carbons. (There are also four quaternary carbons incapable of substitution.) See also the specification at page 4, last paragraph. Clearly, some of these substituents are more reasonable than others in the case of attachment to the indolyl nitrogen (e.g., hydrogen, alkyl, aryl, aralkyl, silyl), and others are more commonly aromatic substituents (e.g., halogen or nitro), but the person skilled in the art understands this. Applicants respectfully ask the Examiner to enter the amendment and withdraw the Section 112 rejection.

V. Response to the Section 103 Rejection

Applicants traverse the rejection of claims 1-15 under 35 U.S.C. § 103(a) as unpatentable over WO 99/24446 (Nifant'ev) in view of Sugano et al. (U.S. Pat. No. 5,648,440), and they respectfully ask the Examiner to reconsider and withdraw the rejection in view of the following remarks.

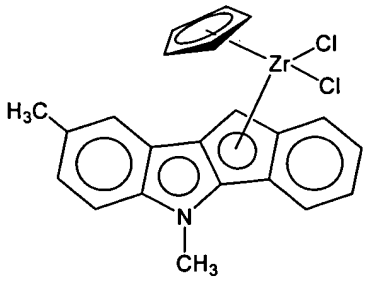
As the Examiner correctly notes, Nifant'ev teaches the use of indenoindolyl complexes with alumoxane activators, but the reference does not disclose activators that are "the reaction product of an alkylaluminum compound and an organoboronic acid" as Applicants' claims require. For the missing teachings, the Examiner relies on Sugano, which discloses activators that are within the scope of Applicants' claims. (In fact, Applicants teach that "[s]uitable methods for making the aluminoboronates are outlined in U.S. Pat. Nos. 5,648,440 and 5,414,180" and incorporate these teachings by reference.) The Examiner asserts that it would have been obvious to a skilled person to substitute an indenoindolyl complex of Nifant'ev for the metallocenes of Sugano because Sugano's metallocenes have a similar structure. Applicants note that the very first of forty-two unbridged metallocenes disclosed by Sugano (see col. 7, line 55) is bis(cyclopentadienyl)zirconium dichloride, a common benchmark metallocene complex used by Applicants in their comparative examples. The Examiner also urges that the skilled person would have found it obvious to apply Sugano's teachings to Nifant'ev's disclosure "with a reasonable expectation of obtaining a highly-useful catalyst with the advantage of the catalysts being more

active due to greater solubility of the cocatalyst." As discussed below, Applicants respectfully disagree with the conclusion of obviousness.

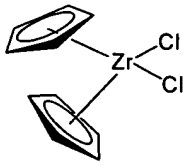
Applicants do not agree that the references cited are properly combinable. To be combinable, specific teachings in the art must suggest the combination. The Examiner infers that the suggestion comes from the "similar structure" of Sugano's metallocenes. However, in spite of naming at least 116 specific metallocene complexes (see cols. 7-10), Sugano did not manage to recite a single indenoindolyl complex. Moreover, as the Examiner acknowledges, Nifant'ev is silent regarding the use of aluminoboronates with indenoindolyl complexes. Thus, the connection between the references is, at best, weak.

If the references were properly combinable, a prima facie case of obviousness might be asserted. However, Applicants have provided ample evidence in the form of comparative results to rebut any prima facie case.

Let's review Applicants' experimental results. For convenience, the results are summarized in the table below. Three sets of comparisons are indicated. The structures of complexes A and B are also provided below. One set of experiments compares the activities of aluminoboronate-activated complexes. The second set uses a combination of an aluminoboronate and an alumoxane (PMAO) with the two complexes. The third set compares the effect of aluminoboronate alone versus aluminoboronate plus alumoxane for just the indenoindolyl complex (A). All of the data come from Applicants' specification.



A
Indenoindolyl complex



B
Metallocene complex

Summary of Applicants' Results					
Ex #	Complex	PMAO	Alumino-boronate	Al/Zr (molar)	Activity (kg PE/g Zr/h)
3	A	no	yes	80	426
C5	B	no	yes	80	47
6	A	yes	yes	50	651
C8	B	yes	yes	50	29
6	A	yes	yes	50	651
C7	A	yes	no	190	501

If it were obvious to use an indenoindolyl complex with an aluminoboronate activator from looking at the combined teachings of Sugano and Nifant'ev, then we should expect Complex A to perform roughly the same as Complex B when each is combined with an aluminoboronate. In fact, Applicants found (Example 3 vs. Comparative Example 5) that indenoindolyl complexes, when activated with aluminoboronates, are almost an order of magnitude (10x) more active than the benchmark metallocene complex.

The Examiner said that a skilled person would have expected high activity from Applicants' claimed catalyst systems "due to greater solubility of the cocatalyst," presumably noting Sugano's teachings that using aluminoboronates can obviate the need for aromatic hydrocarbon solvents (col. 3, ll. 29-39). However, any solubility advantage of aluminoboronates applies whether the catalyst is a metallocene or an indenoindolyl complex. Thus, even this argument predicts equivalent (or nearly so) results from indenoindolyl and metallocene complexes. Without Applicants' experimental demonstration, who could have predicted a ten-fold improvement in activity?

In the second comparison (Example 6 vs. Comparative Example 8), Applicants showed that the advantage with indenoindolyl complexes applies with even greater force when the activator used is a mixture of an alumoxane and an aluminoboronate. Nothing in the art suggests the twenty-fold increase in activity for indenoindolyl complex A (651 kg PE/g Zr/h) versus metallocene complex B (29 kg PE/g Zr/h).

Finally, Applicants demonstrated that the use of an aluminoboronate activator allows more efficient use of aluminum. With an alumoxane alone (Comparative Example 7), an indenoindolyl complex needed an Al/Zr mole ratio of 190 to achieve an activity of 501 kg PE/g Zr/h. In contrast, when an aluminoboronate was used with an alumoxane at a much lower Al/Zr mole ratio of 50 (i.e., only about 25% of the Al used in Comparative Example 7), the activity of the indenoindolyl complex increased 130% to 651 kg PE/g Zr/h.

In sum, Sugano and Nifant'ev are not properly combinable, but even if they were, Applicants have provided more than ample evidence of nonobviousness in the use of indenoindolyl complexes and aluminoboronate activators. The Examiner should reconsider and withdraw the rejection under Section 103(a).

VI. Conclusion

Applicants believe that the amendments and remarks place this application in condition for allowance. Therefore, they respectfully ask the Examiner to enter the amendment, reconsider and withdraw the rejections, and pass the case to issue. Applicants invite the Examiner to telephone their attorney at (610) 359-2276 if he believes that a discussion of the application would be helpful.

Respectfully submitted,

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